Visualizing Basketball Analytics

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How can we summarize key aspects of basketball games in visually novel and useful ways?

Goal: Our team aimed to use Duke's player tracking data, along with other sources, to generate visualizations that help analyze a basketball game. We achieved this by making a wide variety of visualizations, such as Gameflow Charts, Game Summary Table, and Zone Shot Charts. We also created a Points and Assists Network, along with a video showing how this network changed over the course of the game. Then, we integrated all of our visualizations into an R Shiny app, which enables users to easily analyze any Duke basketball game, as well as make comparisons between two games.

Background: Player tracking technology is the basis of modern sports analytics, but this technology, for the most part, has only been implemented at the professional level. Duke University, knowing the immense value of capturing this information, installed 6 SportVU cameras in Cameron Indoor Stadium. SportVU is a system of 6 cameras that provides in-depth statistics, including real-time player and ball positioning, through sophisticated software and statistical algorithms. Duke basketball has provided our team with this data, with the task of utilizing it to provide game summary visualizations that will enhance the fan experience and help the team.

Turning Data Into Visualizations 🔍

Web Scraping → **Clean Data** → **Visualize** → **Build R Shiny App**

Step 1:

Web Scrape to gather supplementary data for each game from ESPN.com such as play-by-play information and box-score. Pair this new data with the SportVU player tracking data.

Step 2:

Clean dataset. For example, rotate the x and y coordinates of the player tracking data by 90° in order to make a horizontal basketball court.

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

Step 3:

Visualize basketball games via a variety of figures: Game Summary Table, Gameflow Chart, Shot Charts, and Points and Assists Network (static and dynamic)

Step 4:

Build a user-friendly R Shiny App that integrates the visualizations. Allow the user to select two games and present the visualizations for side-by-side comparison.

SportVU Dataset:

Game ID	Time	Team 1 ID	Team 2 ID	Game Clock	Shot Clock	Event ID
20141114	1.4101e+12	1472	1388	1099.42	27.00	23

Event Descrip	(x,y) of each player	(x,y,z) of ball	Name	Global ID	Position	Ball Carrier ID
touch	35.48...	35.46 ...	Quinn Cook	601140	G	2

Duke Score Differentials 2015-2019

Game Location: Cameron Indoor, Away
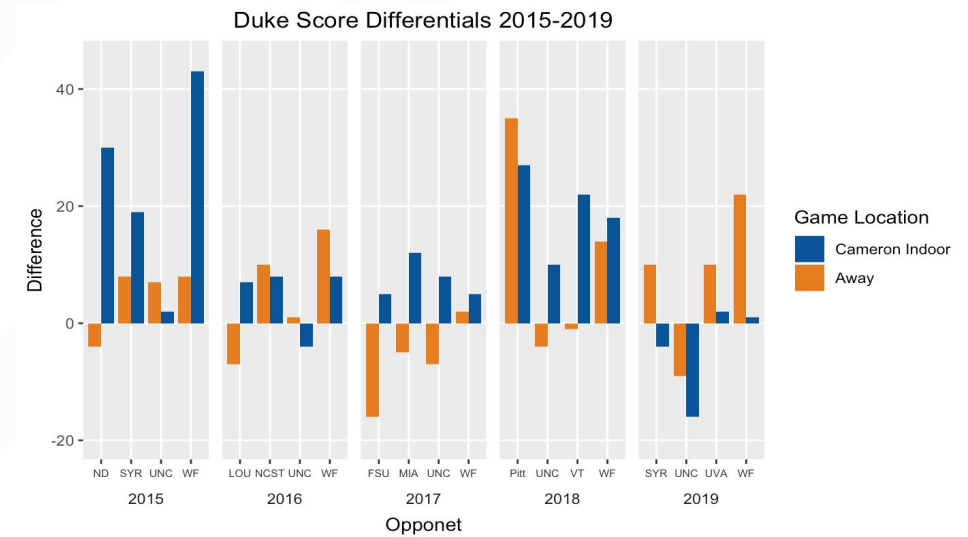
Comparing Two Games Through Visualizations

Currently, there is no simple way to compare two games side-by-side. **We have solved this problem by developing an app that easily compares visualizations between two games.**

After choosing two games to compare, each of these interactive graphs are automatically generated for each game:

- Gameflow Diagram
- Game Summary Table
- Points and Assists Network (Static)
- Temporal Points and Assists Network Video
- Shot Charts Graph by Zone

Our R Shiny app:
tinyurl.com/duke-bball-vis
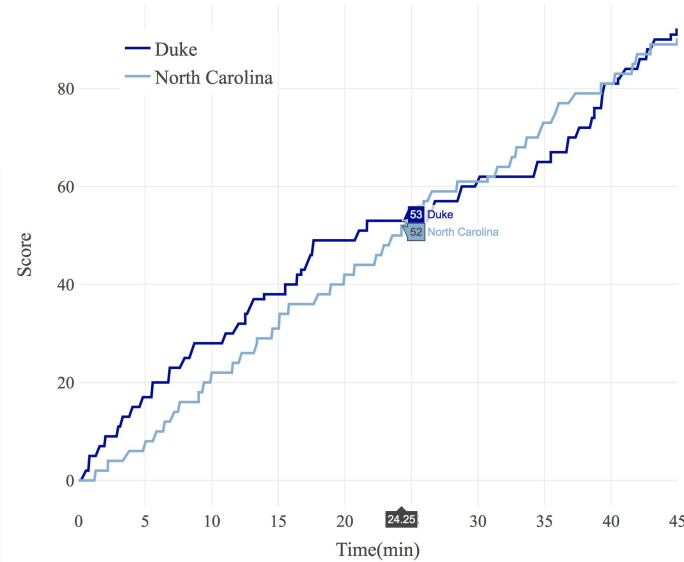
North Carolina	Category	Duke
45.8	Field Goal %	50.8
20.0	Three Point %	62.5
49	Rebounds	46
21	Assists	18
11	Total Turnovers	16